

1 Claims

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3 1. A process for preparing a particulate solid

4 material comprising the steps of:

5 (a) obtaining a paper-fibre waste solid material

6 having a ratio of china clay, or equivalent, to

7 chalk, or equivalent, greater than a pre-determined

8 minimum;

9 (b) treating the material to reduce the moisture

10 content and form a granular material; and

11 (c) calcining the granular material at a temperature

12 of approximately 1300°C or higher to provide a

13 particulate, 100% solids, material.

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15 2. A process as claimed in claim 1 wherein the

16 paper-fibre waste solid material is non-hazardous

17 waste material arising from the recycling of waste

18 paper and tissue.

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20 3. A process as claimed in claim 2 wherein the

21 paper-fibre waste solid material is in the form of

22 sludge.

23

24 4. A process as claimed in any one of the preceding

25 claims wherein the paper-fibre waste solid material

26 has a moisture content of over 45%.

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28 5. A process as claimed in claim 4 wherein the

29 paper-fibre waste solid material has a moisture

30 content of over 55%, optionally 60%.

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1 6. A process as claimed in any one of the preceding
2 claims wherein minor components in the paper-fibre
3 waste solid material including non-fibrous
4 contraries materials are removed prior to step (b).
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6 7. A process as claimed in any one of the preceding
7 claims wherein the paper-fibre waste solid material
8 is waste paper from a paper making process.
9

10 8. A process as claimed in any one of the preceding
11 claims wherein the china clay or equivalent includes
12 any form of hydrated aluminium silicate, including
13 kandites, kaolins and the like.
14

15 9. A process as claimed in any one of the preceding
16 claims wherein the chalk or equivalent includes any
17 form of calcium carbonate, which includes the forms
18 of limestone.
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20 10. A process as claimed in any one of the preceding
21 claims wherein the process further includes the step
22 of:
23 dewatering the paper-fibre waste solid material
24 prior to step (b).
25

26 11. A process as claimed in claim 10 wherein the
27 dewatering process provides a sludge material having
28 a solids content generally in the range 22-55%.
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30 12. A process as claimed in claim 10 or claim 11
31 wherein analysis of the china clay:chalk ratio is

1 carried out prior to the dewatering of the waste
2 material.

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4 13. A process as claimed in any one of the preceding
5 claims wherein the determination of the ratio of the
6 china clay:chalk is carried out using the 'acid
7 extraction' method.

8

9 14. A process as claimed in claim 13 wherein the
10 pre-determined minimum ratio using the "acid
11 extraction" method is approximately 0.2.

12

13 15. A process as claimed in any one of claims 1 to 12
14 wherein the determination of the ratio of the china
15 clay:chalk is carried out using the "ash/acid
16 extraction" method.

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18 16. A process as claimed in claim 15 wherein the
19 pre-determined minimum ratio using the "ash/acid-
20 extraction" method is approximately 0.13.

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22 17. A process as claimed in any one of the preceding
23 claims wherein a conditioning material is added to
24 the paper-fibre waste solid material in step (a).

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26 18. A process as claimed in claim 17 wherein the
27 conditioning agent raises the china clay:chalk ratio
28 above the pre-determined minimum.

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30 19. A process as claimed in claim 17 or claim 18
31 wherein the conditioning material is partly,

1 substantially or wholly china clay, or at a china
2 clay suspension, or another silicate material.

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4 20. A process as claimed in any one of claims 17 to
5 19 wherein a dispersing agent is added with the
6 conditioning agent.

7

8 21. A process as claimed in any one of claims 17 to
9 20 wherein the material has a solids content of less
10 than 45%, optionally 22% or lower.

11

12 22. A process as claimed in any one of the preceding
13 claims wherein the ratio of silica and aluminium to
14 natural fillers in the paper-fibre waste solid
15 material is also determined.

16

17 23. A process as claimed in any one of the preceding
18 claims wherein the treatment step (b) includes
19 compression and/or extrusion of the material.

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21 24. A process as claimed in Claim 23 wherein step
22 (b) is carried out by a granulating press.

23

24 25. A process as claimed in any one of the preceding
25 claims wherein the treatment step (b) is provided by
26 direct heat contact.

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28 26. A process as claimed in claim 25 wherein a heat
29 transfer material is used.

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1 27. A process as claimed in any one of the preceding
2 claims wherein the treatment step (b) is carried out
3 with agitation.

4

5 28. A process as claimed in claim 27 wherein the
6 agitation is provided by a rotary apparatus.

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8 29. A process as claimed in claim 28 wherein the
9 rotary apparatus is inclined.

10

11 30. A process as claimed in claim 28 or claim 29
12 wherein the rotary apparatus allows for a wholly or
13 substantially continuous feed of material.

14

15 31. A process as claimed in any one of the preceding
16 claims wherein the treatment step (b) is carried out
17 at a raised temperature, optionally between 60-80°C.

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19 32. A process as claimed in any one of the preceding
20 claims wherein step (b) is carried out under an
21 inert atmosphere.

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23 33. A process as claimed in any one of the preceding
24 claims wherein the granular material provided by
25 step (b) comprises granules in the range 3mm-30mm in
26 size.

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28 34. A process as claimed in any one of the preceding
29 claims wherein the granular material formed by step
30 (b) is reduced in size, optionally by grinding or
31 milling.

32

1 35. A process as claimed in any one of the preceding
2 claims wherein the granular material formed by the
3 treatment step (b) has a solids content in the range
4 of approximately 45-90% solids.

5

6 36. A process as claimed in any one of the preceding
7 claims wherein the calcining of the granular
8 material reduces the moisture in the material wholly
9 or substantially to zero.

10

11 37. A process as claimed in any one of the preceding
12 claims wherein particulate material being formed by
13 step (c) is partly or substantially porous.

14

15 38. A process as claimed in any one of the preceding
16 claims wherein the granular material is calcined
17 with agitation.

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19 39. A process as claimed in claim 38 wherein the
20 agitation is provided by a rotary apparatus.

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22 40. A process as claimed in claim 39 wherein the
23 rotary apparatus is a high temperature rotary
24 furnace tube.

25

26 41. A process as claimed in any one of the preceding
27 claims wherein the calcining temperature is greater
28 than 1300°C, optionally approximately 1320°C, or
29 optionally higher.

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1 42. A particulate solid material whenever prepared
2 by a process as defined in any one of claims 1 to
3 41.

4
5 43. A particulate solid material formed from a
6 paper-fibre waste solid material having a bulk
7 density of less than $1,000\text{kg/m}^3$, preferably in the
8 range 560kg/m^3 to 800kg/m^3 , and in the form of an
9 aggregate having a mean particle size in the range 3
10 to 15mm.

11
12 44. A particulate solid material as claimed in claim
13 42 or claim 42 being a light-weight aggregate for
14 making cementitious, concrete or other building
15 blocks.

16
17 45. A particulate solid material as claimed in claim
18 42 or claim 43 having a particle size of less than
19 $100\mu\text{m}$, and being a cementitious material.